CHAPTER B6

RESPIRATORY PROTECTION

B0601. DISCUSSION

a. Many repair and maintenance operations generate air contaminants that are dangerous if inhaled. Engineering controls (e.g., local exhaust ventilation) are the most effective methods of protecting personnel against such contaminants. However, when engineering controls are not practical or feasible, respirators are necessary to assure the protection of personnel.

b. This chapter establishes respiratory protection requirements and applies to all personnel and visitors who enter an area where respiratory protective equipment is necessary. Many of the procedures contained herein are derived from or are similar to the ones detailed in reference B6-1. This chapter does not address damage control, gas free engineering, or underwater protection.

c. **For submarines.** Responsibilities and procedures for respiratory protection aboard submarines are contained in paragraph B0615.

B0602. RESPONSIBILITIES

a. **The commanding officer shall** appoint a respiratory protection manager (RPM).

b. **The respiratory protection manager shall**:

(1) Qualify per B0612 within 3 months of assuming the position.

(2) Ensure a sufficient supply of NIOSH or NIOSH/MSHA approved respirators, spare parts, and expendable supplies (e.g. cartridges and filters) is maintained to conduct routine and emergency operations. There should be at least three sizes of elastomeric face pieces and associated supplies of at least two manufacturers.

NOTE:

Respirator parts and filters are not interchangeable. Ensure that all components are of the same manufacturer (e.g. Brand X facepieces must have Brand X filters).

(3) Base the selection of the class of respirators on the type and degree of hazards to which workers are exposed.

(4) Maintain a roster of personnel enrolled in Respiratory Protection.

(5) Conduct respirator fit testing per paragraph B0608.

(6) Establish central control points for issuing and maintaining respiratory protection equipment. Divisions that frequently use respirators and personnel who are assigned individual respirators may maintain custody of their own respiratory protection equipment and are responsible for its proper case and storage.

(7) Inspect, clean, disinfect, store, maintain and repair respirators per paragraph B0609.

(8) Ensure breathing air meets the requirements of paragraph B0611.

c. **Division officers shall**:

(1) Ensure that personnel performing work requiring respirators are assigned and qualified prior to use of respiratory protective equipment. Use the form in Appendix B6-A to request medical qualification.

(2) Ensure that personnel have a current fit test and training prior to donning a respirator.

(3) Provide personnel with the required respiratory protective equipment.

d. **The medical department representative (MDR) shall**:

(1) Conduct or schedule necessary preplacement and periodic medical evaluation of personnel identified by the RPM as respirator users per paragraph B0614.

(2) Certify to the cognizant division officer and the RPM whether an individual is medically qualified to use a particular respirator. Use the form in Appendix B6-A for this purpose.

(3) Enter results of all respirator user medical evaluations into the individual's medical records.

(4) Assist the RPM in identifying and evaluating hazards and selecting appropriate respirators.

e. **Personnel issuing respiratory protective equipment shall** issue respirators only to personnel who are trained, medically qualified and successfully fit-tested for the respirator(s) requested.

f. **All hands shall**:

(1) Inspect the respirator before and after each use per paragraph B0609a.

(2) Perform a positive and negative respirator facepiece seal check prior to each use per paragraph B0607b.

(3) Report any malfunction of the respirator to their immediate supervisor.

(4) Prevent damage to or loss of respiratory protective equipment.

B0603. RESPIRATORY PROTECTION ELEMENTS

a. Respiratory protection management

b. The industrial hygiene survey

c. Respirator selection

d. Respirator availability

e. Personnel roster

f. Medical evaluations

g. Initial and annual fit testing and training

h. Respirator issue

i. Respirator maintenance

j. Breathing air requirements

B0604. TYPES OF RESPIRATORS AND THEIR APPLICATIONS

The two basic types of respirators are air-purifying and atmosphere-supplying. Illustrations of typical respirators are provided in Appendix B6-B.

a. Air-purifying respirators remove air contaminants by filtering, or absorbing them as the air passes through the cartridge. In all cases when using air-purifying respirators, adequate oxygen (19.5 percent by volume) must be present. They are available with quarter-, half-, and full-facepieces with the full-facepiece respirator providing a higher degree of protection than either of the others. Air-purifying respirators are available as single-use (e.g., disposable) respirators, with the filter or cartridge built-in as an integral part of the respirator, or as reusable facepieces with replaceable cartridges, filters, and pre-filters of many types. They are effective only when used with the appropriate cartridges, filters, and pre-filters for the air contaminants present. Air-purifying respirators may be either non-powered or powered. The non-powered type depends on the user's lungs to draw air through the purifying element during inhalation; therefore, the non-powered type has the greatest breathing resistance. The powered type is equipped with a battery-powered fan that forces air through the purifying element, thus reducing the breathing resistance and ensuring a positive pressure inside the facepiece. Whether powered or non-powered, air-purifying respirators may be subdivided by the type of contaminant they protect against as described below.

(1) Particulate air-purifying respirators use cartridges, filters, and pre-filters designed to protect against inhalation of aerosols, i.e., solid or liquid particles dispersed in air. The cartridges, filters, and pre-filters remove nuisance (e.g. non-toxic) and toxic dusts, fogs, fumes, mists, smokes and sprays either singly or in combination. Their construction varies according to the intended use that is specified in each device's approval. SURGICAL MASKS (blue or green) do not provide protection against air contaminants. They are for **MEDICAL/DENTAL USE ONLY** and must **NEVER** be used as an air-purifying respirator.

(2) Gas and vapor air-purifying respirators use cartridges and canisters that remove contaminants through absorption and adsorption. Typically, a cartridge removes a specific type of gas or vapor, i.e., organic vapors or acid gases.

(3) Combination cartridges and canisters are available which combine the removal capabilities of two or more type cartridges in a single cartridge, i.e., organic vapor and particulate removal, acid gas and organic vapor removal, or acid gas, ammonia, and organic vapor removal. Some manufacturers allow users to create their own combination cartridges by screwing two cartridges together; however, always follow the manufacturer's recommendations when doing this since there may be some limitations.

(4) **Prefilters.** All manufacturers allow the user to combine different degrees of particulate removal with any cartridge by attaching a pre-filter to the cartridge by means of a retainer ring. Such systems are commonly used to protect against an aerosol containing a volatile organic solvent.

(5) **Color Coding.** By federal regulation, each type of respirator cartridge/canister is color coded to identify its intended use. The color-coding may be achieved by coloring all or part of the cartridge/canister case or by affixing a colored label.

(6) **Labeling.** Each cartridge/canister is labeled with the contaminant(s) it protects against and the NIOSH/MSHA approval number. Some labels may provide more information about the cartridge's capabilities and limitations.

(7) Military gas masks (e.g., Mark V, M17) are military-unique air-purifying respirators that are only to be used for chemical-biological-radiological (CBR) warfare. MILITARY GAS MASKS MUST NEVER BE USED IN PLACE OF AN AIR-PURIFYING RESPIRATOR. This chapter does not apply to the use and maintenance of military gas masks.

b. Atmosphere-supplying respirators are used when the contaminant has no warning property (e.g., no odor), the contaminant's concentration is too high to use an air-purifying respirator, or the environment is immediately dangerous to life or health (IDLH). The two types are supplied-air respirators and self-contained breathing apparatuses.

(1) Supplied-air respirators are further subdivided into hose mask and air-line respirators.

(a) Hose mask respirators consist of a facepiece, breathing tube, harness, and large-diameter, thick-wall, non-kinking, air-supply hose. The air may be supplied by a blower, either motor or hand driven, or the user, unaided, may simply draw the air into the hose with each breath. This respirator offers no advantages over the air-line respirator and is being removed from the fleet.

(b) Air-line respirators consist of a facepiece, hood, helmet, or suit; breathing tube; regulator; and small-diameter hose provided with some means to attach the hose to the user. Air is provided by a compressor, ambient air breathing apparatus (AABA), or compressed air cylinder(s). The maximum length of hose allowed from a compressor or air fitting to the respirator shall be 300 feet unless a shorter maximum length is specified on the NIOSH/MSHA approval. The NIOSH/MSHA approval for each air-line respirator applies to the combination of the respirator and air supply hose as a unit and specifically to the part numbers listed on the approval. Any use of another manufacturer's respirator or hose automatically invalidates the approval. Air-line respirators can be subdivided into three types as follows:

1. Demand. Available only with a facepiece, it supplies air to the user on demand (inhalation) which creates a negative pressure within the facepiece. Leakage into the facepiece may occur if there is a poor seal between the respirator and the user's face.

2. Pressure Demand. Available only with a facepiece, it maintains a continuous positive pressure within the facepiece, thus preventing contaminant leakage into the facepiece.

3. Continuous Flow. Available with a facepiece, hood, helmet, or suit, it provides a continuous positive pressure and flow of air within any of the breathing zone containments, thus preventing contaminant leakage into the containment.

(2) Self-contained breathing apparatuses (SCBAs) consist of a facepiece, helmet, or hood; a breathing tube; and a source of air or oxygen, all of which is carried by the wearer. They may be subdivided into two categories.

(a) **Closed-circuit (Rebreathing) SCBAs.** There are two types of this respirator. In both types carbon dioxide (CO_2) in the exhaled breath is removed by a chemical canister prior to rebreathing. The difference between the two is the source of oxygen. In one type, the oxygen is provided by either high-pressure gaseous oxygen or gaseous oxygen converted from liquid oxygen. In the other type, of which the Navy "oxygen breathing apparatus" (OBA) is an example, the water vapor in the exhaled breath reacts with a chemical in the canister to release oxygen. The OBA is not approved by NIOSH/MSHA for commercial use, and its only authorized uses aboard ship are for damage control, fire-fighting operations, and fixed flooding systems PMS. Even in emer-

gencies, OBAs must not be used in flammable atmospheres due to the heat generated by the canister.

(b) **Open-circuit SCBAs.** In this type of SCBA, the exhaled air is expelled to the atmosphere and air is provided to the user from a compressed air cylinder. This type of respirator is available in either a demand (negative facepiece pressure) or pressure-demand (positive facepiece pressure) model.

(c) **Emergency Escape Breathing Device (EEBD).** This is a special type of SCBA developed for the Navy specifically for emergency escape from shipboard fires. They have a very short duration air supply. **THEY MUST NEVER BE USED FOR ENTRY INTO A HAZARDOUS ATMOSPHERE; THEY ARE FOR ESCAPE ONLY**! This chapter does not apply to the use and maintenance of the EEBD.

(d) **Supplemental Emergency Escape Device (SEED).** This is another special type of SCBA developed for main propulsion space watch standers ONLY. They have a very short duration air supply. **THEY MUST NEVER BE USED FOR ENTRY INTO A HAZARDOUS ATMOSPHERE; THEY ARE FOR ESCAPE ONLY**!

B0605. RESPIRATOR SELECTION

a. **Approval.** Only respirators which are approved by NIOSH shall be used. If there is any doubt as to the respirator required to protect against a particular contaminant, an industrial hygienist should be consulted.

b. **Hazard Assessment.** Determining the type of contaminant and its concentration is the most important consideration in the selection of respirators. This determination shall be provided as part of the most current industrial hygiene survey or by an industrial hygienist upon request. The industrial hygiene survey report of the industrial hygienist shall identify and evaluate the respiratory hazard(s) in the workplace; this evaluation shall include a reasonable estimate or employee exposures to respiratory hazard(s). Where the employee’s exposure to respiratory hazard(s) cannot be identified or reasonable estimated by the industrial hygienist, the atmosphere shall be considered IDLH. The following are some chemical, physical and toxicological properties that should be considered in the selection of a respirator:

(1) Warning properties of the contaminant gas or vapor (smell, eye irritation or respiratory irritation). Some contaminants lack sufficient warning properties to alert the wearer of respirator failure. Vapor- and gas-removing respirators are not approved for these contaminants, which include carbon monoxide, hydrogen cyanide, isocyanates and methyl alcohol.

(2) Whether the contaminant is absorbed through the skin.

(3) Whether any of the contaminants are "Immediately Dangerous to Life or Health" (IDLH) or whether injurious effects would be produced after prolonged exposure.

(4) Concentration of the contaminant in the atmosphere.

(5) NAVOSH standard for the contaminant(s). See Chapters B1 and B10 for standards for lead and asbestos.

(6) Whether an oxygen-deficient or oxygen-rich atmosphere exists or may be created.

(7) The nature, extent and frequency of the duties to be performed by personnel (e.g., welding or painting) in the work area.

(8) Degree of protection provided by the particular respirator.

B0606. LIMITATIONS OF RESPIRATORS

Some general limitations have been mentioned in sections B0604 and B0605; however, the following provides more specific information.

a. **Protection Factor**. Each type of respirator provides protection against a contaminant up to a concentration that is a multiple (e.g., 10 times, 50 times, etc.) of that contaminant's permissible exposure limit or action level (see chapters B1 and B10 for some examples). Protection factors are described in detail in reference B6-2, but certain federal standards may assign a lower protection factor for use against a specific contaminant. Since a full-facepiece is less likely to have its facepiece seal broken due to movement, talking, etc., a full-facepiece respirator usually has a higher protection factor than a quarter- or half-facepiece respirator.

b. **Oxygen-deficient Atmospheres**. All air-purifying respirators require that sufficient oxygen be present in the atmosphere where they will be used. Sufficient oxygen is defined as at least 19.5 percent oxygen for use at essentially sea level.

c. **Hose Length/Configuration and Air Pressure Requirements for Air-line Respirators**. The approval specifies the maximum length of air supply hose that may be used with each respirator and this is a function of the pressure of the supplied air.

NOTE:

The allowed hose length for supplied-air respirators is specified on the NIOSH approval certificate, but in no case shall the length exceed 300 feet maximum. Supplied-air respirators shall be operated at the conditions of pressure and hose length specified in the NIOSH approval. Only those hoses supplied by the respirator manufacturer shall be used. Air-line couplings shall be incompatible with outlet couplings for other gas systems to prevent inadvertent servicing with non-respirable gases or oxygen.

d. **Environmental Temperature Operating Ranges.** Atmosphere-supplying respirators have specific temperature ranges for which they are approved. Consult the manufacturer's specifications before use in extreme temperatures.

e. **Maximum Use Concentrations.** Regardless of the protection factor, some air-purifying cartridges and canisters are limited to use at or below a specific contaminant concentration. This is generally due to the capacity (e.g., size or removal efficiency) of the cartridge or canister to remove certain contaminants. The approval certificate should always be consulted before use to determine what additional use restrictions apply.

B0607. USE OF RESPIRATORS

a. Prior to using a respirator to perform work that requires respiratory protection, the following requirements shall be met:

(1) The user shall be certified by the MDR as medically qualified to use each type of respirator required per Section B0614, unless the user is to wear a SCBA. SCBAs are exempt from the requirement for medical qualification.

(2) The user shall pass a fit-test with each type of respirator to be used per Section B0608, unless the user is to wear a SCBA. SCBAs are exempt from the requirement to fit test.

(3) The user shall be trained per Section B0612.

(4) Gas permeable and soft contact lenses are permitted to be worn with all respiratory protection.

(5) Tight fitting respirators shall not be worn when conditions such as facial hair, facial scars, or prescription eyeglasses prevent a good respirator seal.

b. **User Seal Checks.** Prior to each use, perform a positive and negative user seal check prior to each use.

(1) **Positive Pressure User Seal Check.** Place your palm or thumb over the exhalation valve and press lightly. Exhale gently. The respirator is properly sealed if no air leaks around the edges and a slight positive pressure is felt inside the facepiece.

(2) **Negative Pressure User Seal Check.** Place your palm(s) over the cartridge(s) or canister inlet. Inhale gently. The respirator is properly sealed if no air leaks around the edges and a slight negative pressure is felt inside the facepiece as it collapses slightly towards the face.

c. **Warning Signs of Respirator Failure**

(1) **Particulate Air-purifying Respirator.** When breathing difficulty is encountered with a particulate air-purifying respirator (increased resistance due to partial clogging), the filter(s) must be replaced. If the respi-

rator is a single-use (e.g., disposable) respirator then the respirator must be discarded.

(2) **Vapor or Gas Air-purifying Respirator.** When using a vapor or gas air-purifying respirator, if the user notices any of the warning properties, (e.g., odor, taste, eye irritation (with a full facepiece respirator)), or respiratory irritation, he/she should promptly leave the area and replace the cartridge or canister before returning.

(3) **Service Life of Air-purifying Respirator Filters, Canisters, and Cartridges.** Filters, canisters, and cartridges for air-purifying respirators are intended to be used until filter resistance precludes further use, or the chemical sorbent is expended as signaled by a specific warning property, (e.g., odor, taste, and/or irritation). Change end-of-service-life indicator cartridges and canisters when indicated by the appropriate color change. End-of-service-life indicator cartridges and canisters must be worn belt mounted or chest mounted, respectively, so that the end-of-service-life indicator can be seen. New filters, canisters or cartridges shall always be provided when a respirator is reissued. When in doubt about the previous use of the respirator, replace the filter, canister, or cartridge.

(4) **Air-line Respirator.** Leave the area immediately when the compressor failure alarm is activated or if an air pressure drop is sensed.

(5) **Self-contained Breathing Apparatus.** Leave the area as soon as the air pressure alarm activates.

B0608. RESPIRATOR FIT TESTING

Each individual who is required to use a respirator shall be qualitatively or quantitatively fit tested before being issued a respirator and annually thereafter unless the user is to wear a SCBA. SCBAs are exempt from the requirement to fit test. When conditions, such as facial hair, can reasonably be expected to interfere with the proper fit of respiratory protective equipment, the user shall not be permitted to do work requiring a respirator until satisfactory fit testing can be accomplished. An industrial hygienist must be consulted for guidance when these contaminants are involved. Fit testing for all ships can be performed by anyone trained to fit test via training detailed in B0612. Fit testing can also be obtained via the supporting tender, local NEPMUs, the cognizant MTF, or other sources.

a. **Qualitative Fit Testing.** Qualitative fit testing may be performed using irritant smoke, isoamyl acetate (banana oil), saccharin mist, or the Bitrex method. Fit testing shall conform to the procedures in Appendix B6-C

b. **Quantitative Fit Testing.** Personnel using respirators to protect against asbestos and lead exposure may require quantitative fit testing, per Federal regulations. This type of fit testing can only be performed by, and shall be requested from, shore activities.

B0609. INSPECTION, CLEANING, STORAGE AND MAINTENANCE OF RESPIRATORS

To ensure adequate performance and proper sanitation, respirators shall be maintained as follows:

a. **Inspections.** All respirators shall be inspected routinely before and after each use. Emergency use respirators shall be inspected after each use and at least monthly. SCBAs shall be inspected periodically to ensure proper function during an emergency response and after each use and at least monthly. Inspect the following items for at least the listed defects:

(1) Head straps or head harness. Breaks, loss of elasticity, broken or malfunctioning buckles and attachments (full-facepiece only), excessively worn serrations on the head harness which might permit slippage.

(2) Facepiece. Excessive dirt; cracks, tears, holes, or distortion from improper storage; inflexibility (stretch and massage to restore flexibility); cracked or badly scratched lenses in full-facepieces; incorrectly mounted full-facepiece lens or broken or missing mounting clips; cracked or broken air-purifying element holder(s), badly worn threads, or missing gasket(s) (if required).

(3) Inhalation and exhalation valves. Foreign material, such as detergent residue, dust particles, or human hair under the valve seat; cracks, tears, or distortion in the valve material; improper insertion of the valve body in the facepiece; cracks, breaks, or chips in the valve body, particularly in the sealing surface; missing or defective exhalation valve cover; improper installation of the valve in the valve body.

(4) Cartridge, canister, or filter. Incorrect cartridge, canister, or filter for the hazard; incorrect installation, loose connections, missing or worn gaskets, or cross-threading in holder; expired shelf-life date on cartridge or canister; evidence of prior use of sorbent cartridge or canister, indicated by absence of sealing material, tape, foil, etc., over inlet.

(5) Corrugated breathing tubes. Broken or missing end connectors; missing or loose hose clamps; deterioration, determined by stretching the tube and looking for cracks.

(6) Harness of a front- or back-mounted gas mask. Damage or wear to the canister holder which may prevent its being held securely in place; broken harness straps or fastening.

(7) Hoods, helmets, blouses, or full suits. Examine for rips and tears and seam integrity; examine the protective headgear, if required, for general condition, with emphasis on the suspension inside the headgear; examine the protective faceshield, if any, for cracks or breaks or impaired vision due to rebounding abrasive particles; ensure the protective screen is intact and secured correctly over the faceshield of abrasive blasting hoods and blouses.

(8) Air supply systems. Examine for integrity and good condition of the air supply lines and hoses, including attachments and end fittings; correct operation and condition of all regulators, valves, or other air-flow regulators.

b. **Cleaning, Sanitizing, and Storage.** Respirators shall be cleaned and sanitized according to manufacturer's instructions or as follows:

(1) Remove and discard all used cartridges and filters.

(2) Disassemble and hand wash the facepiece and parts in a warm water and mild dishwashing detergent solution. Strong cleaning agents can damage respirator parts. Temperatures above 43°C (110°F) and vigorous mechanical agitation shall be avoided. Solvents (e.g., paint removers), that can affect rubber and other parts, shall not be used. Ultrasonic or other suitable washers may be used per manufacturer's instructions.

(3) Sanitize the facepiece using one of the following methods:

(a) Immerse the facepiece for 2 minutes in a warm water (43° C or 110° F) solution of hypochlorite solution (approximately one milliliter of liquid laundry bleach to one liter of water); or

(b) Immerse the facepiece for 2 minutes in a warm water (43° C or 110° F) solution of iodine (add 0.8 milliliters of tincture of iodine to one liter of water); or

(c) Immerse the facepiece for 2 minutes in a warm water (43 °C or 110° F) solution of other ship's hazardous materials list (SHML) approved commercially available cleansers of equivalent disinfectant quality when used as directed, it their use is recommended or approved by the respirator manufacturer.

(4) Rinse in clean warm water at a temperature of about 110°F. Do not exceed 122°F (50°C).

(5) Air-dry in a clean uncontaminated area in such a way as to prevent distortion of the facepiece. If drying cabinets are used, the drying temperature shall not exceed 122°F (50°C).

(6) Reassemble and reinspect respirator. If replacement parts are necessary, they shall be obtained and installed or the respirator shall be removed from service until the unserviceable parts are replaced. If parts are not available and cannot be replaced, discard the entire facepiece as it cannot be used without all parts in place. Interchange of parts is prohibited.

(7) Place respirator in a clean plastic bag or other container and seal. Zip-lock plastic bags are preferred. Ensure the respirator is completely dry before sealing to prevent mildew.

(8) Store flat in a clean, dry, uncontaminated area without crowding which may distort the respirator facepiece.

c. **Repair and Maintenance**

(1) Personnel shall not service/repair any respirators for which they have not been specifically trained.

(2) No work shall be performed on reducing valves, regulators or alarms of atmosphere-supplying respirators (e.g., air-line respirators and SCBAs). These items shall be returned to the manufacturer for all repairs and adjustments.

B0610. ENTRY INTO IMMEDIATELY DANGEROUS TO LIFE OR HEALTH (IDLH) ATMOSPHERES

a. **Respirators.** Should it become necessary to enter an IDLH atmosphere, only the following two types of respirators shall be used:

(1) A full facepiece, self-contained breathing apparatus (SCBA) operated in the pressure-demand mode.

(2) A full facepiece air-line respirator (operated in the pressure demand mode) equipped with an auxiliary self-contained air supply having a minimum rated service life of 15 minutes. The self-contained air supply of 15 minutes must be sufficient to ensure escape from the IDLH area. These may only be used to enter an IDLH atmosphere when connected to the supplied air source (air-line). The auxiliary self-contained air supply may only be used for egress purposes. If the self-contained air supply (15-minute supply) is insufficient to ensure escape, then a SCBA must be used.

NOTE:

Although specified by Chapter 074, Volume 3 of the Naval Ships Technical Manual, Gas Free Engineering, the equipment required in paragraphs B0610a(1) and (2) is not on the allowance lists of many ships. If the respirators required are not carried aboard ship, an Oxygen Breathing Apparatus (OBA) may be used for entry into atmospheres which are or are potentially IDLH if the following three conditions are met: underway, required by an emergency or for operational readiness reasons, and approved by the commanding officer. For situations which are not an emergency or operational readiness, entry shall be delayed until the ship returns to port and the entry may be made by an activity which has proper respiratory protection equipment. The above requirements do not apply to use of an OBA for damage control or fire fighting.

b. **Standby Personnel.** At least one trained standby person, with a suitable respirator per paragraph B0610a, shall be present in the nearest uncontaminated area. If the standby person enters the IDLH atmosphere, there shall be a second standby person with a suitable respirator in the uncontaminated area.

c. **Communications.** The standby person and those persons working in the IDLH atmosphere shall be able to communicate continuously with each other, i.e., visually, by telephone or radio or signal line.

d. **Rescue Equipment.** Persons who enter any IDLH atmosphere shall also be equipped with safety harnesses and lines that can be used to rescue them should they lose consciousness. A hoist shall be present for removing personnel from the IDLH atmosphere. For more information on rescue operations and gas free engineering, refer to Chapter B8.

CAUTION

Tanks, voids, compartments and other confined spaces may contain atmospheres that are hazardous to life or health. This may be due to the presence of flammable or toxic air contaminants or the absence of sufficient oxygen to sustain life. No one shall be permitted to enter any such area until tests of the atmosphere are completed by a qualified gas free engineer and entry by personnel is authorized by competent authority.

CAUTION

Eductors located in remote spaces, if activated, can remove all breathing air. Ensure sufficient make-up air is provided and the space has adequate oxygen prior to entry in all eductor equipped remote spaces.

B0611. BREATHING AIR REQUIREMENTS

a. **Air Quality.** Breathing air or the air output of pumps or compressors which are sources of breathing air for air-line respirators or SCBAs shall meet at least the minimum requirements for Grade D breathing air per reference B6-3.

b. **Ship's Low Pressure (LP) Air Compressors.** Ship's LP air is not suitable for use as breathing air unless specifically tested and certified to meet the purity standards in paragraph B0611a.

c. **Ambient Air Breathing Apparatus (AABA).** Air intakes for portable pumps such as the AABA shall be placed in an area free of contaminants. Periodic testing of the air quality from an AABA is not required. AABAs shall not be used for entry into IDLH atmospheres.

d. **Frequency of Testing.** The air output of compressors used by breathing air shall be tested quarterly. Quarterly testing of breathing air does not apply to the Navy Diving Program. Reference B6-4 addresses diving air requirements.

B0612. RESPIRATORY PROTECTION TRAINING

a. Proper respirator training is essential for personnel required to wear respirators and for supervisors of those wearing respirators. Documented training shall be given prior to respirator use and annually thereafter, and shall include the following topics:

(1) Proper fitting and wearing of the respirator, including how to perform user seal checks. Each person shall demonstrate the capability to don and wear each type of respirator to be worn in the performance of normal and emergency duties including situations in which the respirator malfunctions.

(2) Respirator capabilities and limitations

(3) Nature and degree of respiratory hazards and the effects from exposure to the hazardous atmosphere

(4) Proper respirator selection according to intended use

(5) Respirator care, cleaning, maintenance and storage

(6) Prohibition against facial hair and the proper use of contact lenses when wearing respirators

(7) How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.

b. Respiratory protection managers (RPM) on submarine tenders (AS), aircraft carriers (CV and CVN), amphibious assault ships (LPH, LHA, and LHD), and selected combat logistics ships (AOE) shall attend Respiratory Protection Program Manager's course (CIN A-4J-493-5-0072 or the latest course identification number). All other RPMs shall attend RPM course (CIN A-4J-00482). Courses are available from the Navy Occupational Safety and Health Environmental Training Center.

c. Personnel assigned to issue respiratory protective equipment shall be trained on respirator selection, and care and maintenance prior to assignment and annually thereafter. The training should be given by the facility Respiratory Protection Manager (RPM).

d. See chapter A7 for training aids to assist in respiratory protection training.

B0613. RESPIRATORY PROTECTION EVALUATION

The need for the use of respirators shall be evaluated during an industrial hygiene survey.

B0614. MEDICAL EVALUATIONS

a. **Frequency.** The frequency of the evaluation shall be at least every 5 years below age 35, every 2 years from age 35 to 45, and changing to annually starting at age 45. Special evaluations shall be performed after prolonged absences from work for medical reasons or whenever a functional disability has been identified.

b. **Examiner.** A physician or a registered/occupational health nurse, physician's assistant, preventive medicine technician, or a hospital corpsman (independent duty technician, NEC 8425 or submarine medical technician, NEC 8402 only) under the supervision of a physician may conduct the medical evaluation. If all answers to the medical history questionnaire in Appendix B6-D are negative and the examiner's consideration of the respirator to be used, frequency of respirator use, and type of work performed by the individual raises no other concerns, the examiner may certify that the individual is medically qualified to use that respirator. A "Yes" answer to any of these questions requires a referral to a physician if the condition is not stable and has not been previously evaluated. If the examiner's consideration of the respirator to be used, frequency of respirator use, and type of work performed by the individual raises other concerns, the individual must be referred to a physician for examination and disposition. Medical evaluation reports that restrict or do not permit respirator use should be signed by a physician. If the examiner's supervisory physician is not on site, the examiner's consultation with the supervising physician shall be annotated in the medical record. All examiners shall be guided by the information in this section when evaluating an individual for respirator use.

c. **Medical History.** A medical history shall be obtained initially and the information should be reviewed and updated during subsequent examinations. A medical history questionnaire should be used to identify the following:

(1) Previously diagnosed disease, particularly stressing cardiovascular, respiratory, or neurological diseases

(2) Physiological problems or symptoms including claustrophobia

(3) Problems associated with breathing during normal work activities

(4) Past problems with respirator use

(5) Past and current usage of medication

(6) Any known physical deformities or abnormalities, including those that may interfere with respirator use

(7) Previous occupations

(8) Tolerance to tachycardia produced by inhalation of heated air.

As a minimum, the medical history questionnaire shall collect all the information requested in the model questionnaire in Appendix B6-D Respirator User's Request Form, which may be adapted onto a SF-600 for medical record entry.

d. **Medical Examination**

(1) **General Considerations.** The examiner's evaluation of suitability of the individual for respirator use shall be based on his/her perception of the individual's work ability and not specifically on a diagnosis.

(2) **Specific Disqualifying Conditions.** Disqualifying conditions for respirator use are found in Appendix B6-E.

(3) **Work Restrictions.** To ensure the safety of the service member, the examiner shall designate work restrictions that are based on the person's medical history or current health condition and are not related specifically to respirator use. Conditions that might require special restrictions or replacement shall include history of heat stroke or heat exhaustion and skin conditions in cases where occlusive materials may result in symptoms or aggravation of the preexisting dermatitis.

(4) **Spirometry.** When properly performed by trained personnel on calibrated equipment, spirometry may be indicated for individuals when the examiner needs additional information as a result of medical history or clinical examination.

B0615. SUBMARINE RESPIRATORY PROTECTION

Respiratory protection is applicable to submarine operations in port. When respiratory protection is required at sea, the installed Emergency Air Breathing (EAB) System is the primary protection. Nuclear system welders may use metal fume respirators with their welding goggles.

a. **Responsibilities**

(1) **The commanding officer shall** appoint a respiratory protection manager(RPM).

(2) **The RPM shall**:

(a) Ensure that up-to-date command guidance exists on respiratory protection. Such guidance will normally be issued in this chapter; however, information unique to the command may be written into a command directive.

(b) Develop and maintain a roster of personnel in the respiratory protection.

(c) For respirators needed while underway (e.g., nuclear welders), provide guidance to the supply officer on the selection of proper types and stock levels of respiratory protective equipment. Sufficient respirators,

spare parts, and expendable supplies (e.g., cartridges and filters) shall be stocked to conduct all operations.

(d) Ensure all respirators retained on board are properly maintained and stored.

(e) Ensure respirator users and supervisors of those wearing respirators are trained on respiratory protection requirements. This training shall be repeated annually. Recordkeeping for respirator fit-testing shall include type of respirator, brand name and model, method of test, test results, test date, and name of the instructor/tester and of the individual tested.

(f) Ensure appropriate fit testing is performed by the supporting IMA.

(g) Receive refresher respiratory protection instructor training every 2 years.

(h) Issue respirator user cards that will contain as a minimum:

1. Name/Social Security Number

2. Last respirator training date

3. Date medically qualified

4. Respirator successfully fit tested (brand, model, size)

5. Signature of fit tester/date/command.

This card will be needed for the supporting submarine Intermediate Maintenance Activity (IMA) to issue respirators. Submarine tenders or IMAs will print respirator user cards upon receipt of a work request.

(i) Coordinate with the supporting submarine IMA to determine what respirators (brand, model, and size) are available for issue.

(3) **Division officers shall:**

(a) Ensure that personnel performing work requiring respirators are assigned and qualified prior to use of respiratory protective equipment. Use the form in Appendix B6-A to request medical qualification.

(b) Ensure that personnel have a current fit test and training prior to donning a respirator.

(c) For respirators needed while in port, ensure personnel obtain required respirator from the supporting submarine IMA.

(d) Ensure non-disposable respirators are returned to supporting submarine IMA when work is completed.

(e) Provide respirators needed while underway (e.g., nuclear systems welders).

(4) **The MDR shall:**

(a) Conduct or schedule the necessary preplacement medical clearance screening and periodic medical examinations of personnel required to use respirators (see paragraph B0614; the MDR is qualified to do these screening and medical evaluations.)

(b) Ensure that all exposure records and the results of all respirator user medical evaluations are entered into the individual's medical record

(c) Assist department heads/division officers in identifying in port work requiring respiratory protection.

(5) **Supporting submarine IMAs shall:**

(a) Upon request, schedule/provide initial or refresher training for the submarine RPM.

(b) Provide a standard submarine respiratory protection lesson plan to submarine RPMs for use in training their crews.

(c) Provide appropriate respirator fit-testing for the submarine respirator users while in port.

(d) Provide only the respirators needed by submarines in port. Respirators will only be issued to personnel with respirator user cards described in paragraph B0615a(2)(h).

(6) **Personnel required to wear a respirator to perform in-port work shall:**

(a) Wear the provided respirator when required and in a proper manner.

(b) Inspect the respirator before and after each use per paragraph B0609a.

(c) Perform a positive and negative respirator facepiece seal check prior to each use per paragraph B0607b.

(d) Report any malfunction of the respirator to their immediate supervisor.

(e) Prevent damage or loss of respiratory protective equipment.

b. **Procedures**

(1) Upon determination that planned work will require respiratory protection, supervisors shall assign personnel to perform the work. Those personnel who have not been previously assigned to work requiring respirator use shall be sent to the MDR for medical clearance qualification.

(2) The MDR shall complete the medical qualification using Appendix B6-A or shall send the individual to the squadron medical officer for such qualification. Appendix B6-A and B6-D can be adapted onto a SF-600 for inclusion in the health record.

(3) Medically qualified personnel shall report to the tender/ submarine base for respirator issue. Those personnel who do not have a current (within 1 year) record of fit testing/training shall be fit-tested and trained by the respirator issuing facility according to the guidelines of paragraph B0612, prior to such issue. All personnel shall receive the following training prior to each issue:

(a) Respirator inspection procedures

(b) Positive and negative facepiece seal checks

(c) Respirator/cartridge service life

(d) Warning signs of respirator failure.

Respirators/cartridges shall be issued for the duration of the job.

(4) Upon completion of work, disposable respirators shall be disposed of; non-disposable respirators shall be returned to the supplying activity.

c. **Training.** Department heads, division officers, leading petty officers, and the MDR shall be trained annually on the recognition of work requiring respirators, respiratory protection procedures, and the proper use of respirators.

CHAPTER B6

REFERENCES

B6-1 29 Code of Federal regulations (CFR) 1910.134, Respiratory Protection (NOTAL)

B6-2 American National Standards Institute (ANSI) Z88.2-1992, Practices for Respiratory Protection. (Adopted by the Department of Defense and available from the Department of Defense Single Stock Point (DoD SSP) in

Philadelphia, PA) (Not required on board ship but listed as a pertinent reference) (NOTAL)

B6-3 American National Standards Institute/Compressed Gas Association, Inc., Commodity Specification for Air, ANSI/CGA G-7.1-1989 (NOTAL)

B6-4 OPNAVINST 3150.27A, Navy Diving Program

Appendix B6-A

MEDICAL CLEARANCE REQUEST

FOR OFFICIAL USE ONLY

From: _____ Division Officer

To: Medical Department Representative

Subj: REQUEST FOR MEDICAL CLEARANCE FOR RESPIRATOR USE

1. The following individual is referred to you for subject clearance:

Name _____ SSN _____ - ____ - _____

Supervisor _____ Date of Birth _____

Circle type(s) of respirator(s) to be used:

Air-purifying (non-powered)	Air-purifying (powered)
Hose mask (with blower)	Hose mask (without blower)
Air-line (demand)	Air-line (pressure-demand)
Air-line (continuous flow)	SCBA (closed circuit)
SCBA (open-circuit, demand)	SCBA (open-circuit, pressure-demand)

Level of Work Effort (Circle one): Light Moderate Heavy Strenuous

Extent of usage (Circle one):

Daily Occasionally but more than once a week Rarely or emergency only

Length of time of anticipated effort (hours per day) _____

Special work considerations (e.g., high places, elevated temperatures, hazardous material, protective clothing required, etc.)

_____

_____

_____

_____
Division Officer Signature and Date

FOR OFFICIAL USE ONLY

From: Medical Department Representative
To: _____ Division Officer

_____ is: (Circle one)

Medically qualified to use the above respirator with no restrictions.

Medically qualified to use the above respirator subject to the restrictions specified below.

Not medically qualified to use the above respirator.

Restrictions _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

MDR Signature and Date

Copy to:
Respiratory Protection Officer

Appendix B6-B

TYPES OF RESPIRATORS

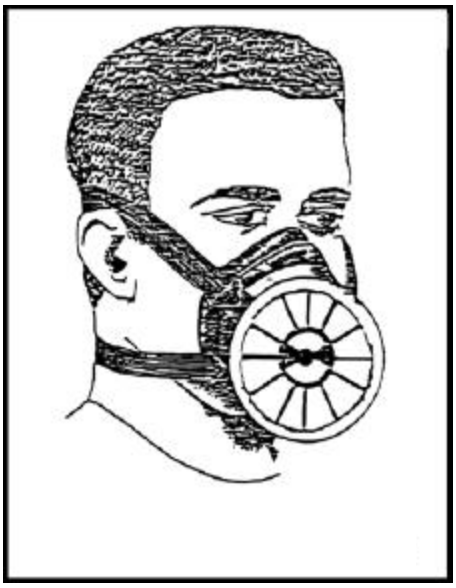

Illustration I – Reusable Facepiece/Replaceable Filter

Illustration II – Disposable Respirator

Illustration III – Reusable Facepiece/Replaceable Cartridge

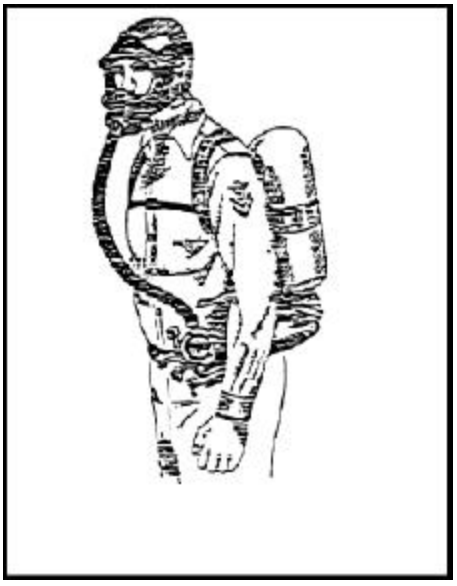

Illustration IV – Self-Contained Breathing Apparatus

Appendix B6-C

Qualitative Respirator Fit Test Protocols

I. Isoamyl Acetate Fit Test

a. The fit test chamber shall be a clear 55-gallon drum liner suspended inverted over a 2-foot diameter frame so that the top of the chamber is about 6 inches above the test subject's head. If no drum liner is available, a similar chamber shall be constructed using plastic sheeting. The inside top center of the chamber shall have a small hook attached.

b. Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors.

c. After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.

d. A copy of the test exercises and any prepared text from which the subject is to read shall be taped to the inside of the test chamber.

e. Upon entering the test chamber, the test subject shall be given a 6-inch by 5-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 ml of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber. An IAA test swab or ampule may be substituted for the IAA wetted paper towel provided it has been demonstrated that the alternative IAA source will generate an IAA test atmosphere with a concentration equivalent to that generated by the paper towel method.

f. Allow 2 minutes for the IAA test concentration to stabilize before starting the fit test exercises. This would be an appropriate time to talk with the test subject; to explain the fit test, the importance of his/her cooperation, and the purpose for the test exercises; or to demonstrate some of the exercises.

g. If at any time during the test, the subject detects the banana-like odor of IAA, the test is failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

h. If the test is failed, the subject shall return to the selection room and remove the respirator. The test subject shall repeat the odor sensitivity test, select and put on another respirator, return to the test area and again begin the fit test procedure described in Ia through g above. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait at least 5 minutes before retesting. Odor sensitivity will usually have returned by this time.

i. If the subject passes the test, the efficiency of the test procedure shall be demonstrated by having the subject break the respirator face seal and take a breath before exiting the chamber.

j. When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test, so that there is no significant IAA concentration buildup in the chamber during subsequent tests. The used towels shall be kept in a self-sealing plastic bag to keep the test area from being contaminated.

II. **Saccharin Solution Aerosol Protocol**. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

a. **Taste threshold screening**. The saccharin taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of saccharin.

1. During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and shoulders that is approximately 12 inches in diameter by 14 inches tall with at least the front portion clear and that allows free movements of the head when a respirator is worn.

2. The test enclosure shall have a 3/4 -inch (1.9 cm) hole in front of the test subject’s nose and mouth area to accommodate the nebulizer nozzle.

3. The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his/her slightly open mouth with tongue extended. The subject is instructed to report when he/she detects a sweet taste.

4. Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the threshold check solution into the enclosure. The nozzle is directed away from the nose and mouth of the person. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

5. The threshold check solution is prepared by dissolving 0.83 gram of sodium saccharin USP in 100 ml of warm water. It can be prepared by putting 1 ml of the fit test solution (see (b)(5) below) in 100 ml of distilled water.

6. To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then released and allowed to fully expand.

7. Ten squeezes are repeated rapidly and then the test subject is asked whether the saccharin can be tasted. If the test subject reports tasting the sweet taste during the ten squeezes, the screening test is completed. The taste threshold is noted as ten regardless of the number of squeezes actually completed.

8. If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the second 10 squeezes, the screening test is completed. The taste threshold is noted as 20 regardless of the number of squeezes actually completed.

9. If the second response is negative, 10 more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the third set of ten squeezes, the screening test is completed. The taste threshold is noted as 30 regardless of the number of squeezes actually completed.

10. The test conductor will take note of the number of squeezes required to solicit a taste response.

11. If the saccharin is not tasted after 30 squeezes (step 10), the test subject is unable to taste saccharin and may not perform the saccharin fit test. Note to paragraph 3. (a): If the test subject eats or drinks something sweet before the screening test, he/she may be unable to taste the weak saccharin solution.

12. If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.

13. Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

14. The nebulizer shall be thoroughly rinsed in water, shaken dry, and refilled at least each morning and afternoon or at least every 4 hours.

b. **Saccharin solution aerosol fit test procedure**

1. The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

2. The fit test uses the same enclosure described in IIb1 above.

3. The test subject shall don the enclosure while wearing the respirator selected in section Ib of this appendix. The respirator shall be properly adjusted and equipped with a particulate filter(s).

4. A second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

5. The fit test solution is prepared by adding 83 grams of sodium saccharin to 100 ml of warm water.

6. As before, the test subject shall breathe through the slightly open mouth with tongue extended, and report if he/she tastes the sweet taste of saccharin.

7. The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of saccharin fit test solution is sprayed into the enclosure using the same number of squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a taste response as noted during the screening test. A minimum of 10 squeezes is required.

8. After generating the aerosol, the test subject shall be instructed to perform the exercises in section Ie of this appendix.

9. Every 30 seconds the aerosol concentration shall be replenished using one half the original number of squeezes used initially (e.g., 5, 10 or 15).

10. The test subject shall indicate to the test conductor if at any time during the fit test the taste of saccharin is detected. If the test subject does not report tasting the saccharin, the test is passed.

11. If the taste of saccharin is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator shall be tried and the entire test procedure is repeated (taste threshold screening and fit testing).

12. Since the nebulizer has a tendency to clog during use, the test operator must make periodic checks of the nebulizer to ensure that it is not clogged. If clogging is found at the end of the test session, the test is invalid.

III. **Bitrex TM (Denatonium Benzoate) Solution Aerosol Qualitative Fit Test Protocol.** The Bitrex TM (Denatonium benzoate) solution aerosol QLFT protocol uses the published saccharin test protocol because that protocol is widely accepted. Bitrex is routinely used as a taste aversion agent in household liquids which children should not be drinking and is endorsed by the American Medical Association, the National Safety Council, and the American Association of Poison Control Centers. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

a. **Taste Threshold Screening.** The Bitrex taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of Bitrex.

1. During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and shoulders that is approximately 12 inches (30.5 cm) in diameter by 14 inches (35.6 cm) tall. The front portion of the enclosure shall be clear from the respirator and allow free movement of the head when a respirator is worn.

2. The test enclosure shall have a 3/4 inch (1.9 cm) hole in front of the test subject’s nose and mouth area to accommodate the nebulizer nozzle.

3. The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his or her slightly open mouth with tongue extended. The subject is instructed to report when he/she detects a bitter taste.

4. Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the Threshold Check Solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

5. The Threshold Check Solution is prepared by adding 13.5 milligrams of Bitrex to 100 ml of 5% salt (NaCl) solution in distilled water.

6. To produce the aerosol, the nebulizer bulb is firmly squeezed so that the bulb collapses completely, and is then released and allowed to fully expand.

7. An initial 10 squeezes are repeated rapidly and then the test subject is asked whether the Bitrex can be tasted. If the test subject reports tasting the bitter taste during the 10 squeezes, the screening test is completed. The taste threshold is noted as 10 regardless of the number of squeezes actually completed.

8. If the first response is negative, 10 more squeezes are repeated rapidly and the test subject is again asked whether the Bitrex is tasted. If the test subject reports tasting the bitter taste during the second 10 squeezes, the screening test is completed. The taste threshold is noted as 20 regardless of the number of squeezes actually completed.

9. If the second response is negative, 10 more squeezes are repeated rapidly and the test subject is again asked whether the Bitrex is tasted. If the test subject reports tasting the bitter taste during the third set of 10 squeezes, the screening test is completed. The taste threshold is noted as 30 regardless of the number of squeezes actually completed.

10. The test conductor will take note of the number of squeezes required to solicit a taste response.

11. If the Bitrex is not tasted after 30 squeezes (step 10), the test subject is unable to taste Bitrex and may not perform the Bitrex fit test.

12. If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.

13. Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

14. The nebulizer shall be thoroughly rinsed in water, shaken to dry, and refilled at least each morning and afternoon or at least every 4 hours.

b. **Bitrex Solution Aerosol Fit Test Procedure**.

1. The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

2. The fit test uses the same enclosure as that described in IIIa(1) above.

3. The test subject shall don the enclosure while wearing the respirator selected according to section Ib of this appendix. The respirator shall be properly adjusted and equipped with any type particulate filter(s).

4. A second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

5. The fit test solution is prepared by adding 337.5 mg of Bitrex to 200 ml of a 5% salt (NaCl) solution in warm water.

6. As before, the test subject shall breathe through his or her slightly open mouth with tongue extended, and be instructed to report if he/she tastes the bitter taste of Bitrex.

7. The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of the fit test solution is sprayed into the enclosure using the same number of squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a taste response as noted during the screening test.

8. After generating the aerosol, the test subject shall be instructed to perform the exercises in section Ie of this appendix.

9. Every 30 seconds the aerosol concentration shall be replenished using one half the number of squeezes used initially (e.g., 5, 10 or 15).

10. The test subject shall indicate to the test conductor if at any time during the fit test the taste of Bitrex is detected. If the test subject does not report tasting the Bitrex, the test is passed.

11. If the taste of Bitrex is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator shall be tried and the entire test procedure is repeated (taste threshold screening and fit testing).

IV. **Irritant Smoke (Stannic Chloride) Protocol**. This qualitative fit test uses a person’s response to the irritating chemicals released in the smoke produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.

a. **General Requirements and Precautions**

1. The respirator to be tested shall be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).

2. Only stannic chloride smoke tubes shall be used for this protocol.

3. No form of test enclosure or hood for the test subject shall be used.

4. The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor shall take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.

5. The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

b. **Sensitivity Screening Check.** The person to be tested must demonstrate his or her ability to detect a weak concentration of the irritant smoke.

1. The test operator shall break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.

2. The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.

3. The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.

b. **Irritant Smoke Fit Test Procedure**

1. The person being fit tested shall don the respirator without assistance, and perform the required user seal check(s).

2. The test subject shall be instructed to keep his/her eyes closed.

3. The test operator shall direct the stream of irritant smoke from the smoke tube toward the faceseal area of the test subject, using the low flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within 6 inches of the respirator.

4. If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.

5. The exercises identified in section Ie of this appendix shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of 6 inches.

6. If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.

7. Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.

8. If a response is produced during this second sensitivity check, then the fit test is passed.

Appendix B6-D

MEDICAL QUESTIONNAIRE FOR POTENTIAL RESPIRATOR USERS

Part 1

1. Today's date: _____

2. Your name: _____

3. Your age (to nearest year): _____

4. Your sex (circle one): Male/Female

5. Your height (Feet and Inches): _____

6. Your weight (Pounds): _____

7. Your job title/rate: _____

8. A phone number where you can be reached by the health care professional who reviews this questionnaire (include the Area Code):

_____

9. Circle the type of respirator you will use (you can check more than one category):

a. N, R, or P disposable respirator (filter-mask, non-cartridge type only)

b. N, R, or P non-disposable respirator (filter-mask, with cartridges)

c. Other type of cartridge respirators (for example, dust, fume , mist, or organic vapor respirators)

d. Other types of respirators (for example, powered-air purifying, supplied-air, or self-contained breathing apparatus).

10. Have you ever/previously worn a respirator (circle one): Yes/No
If yes, what type(s):

Part 2

Questions 1 through 9 below must be answered by every person who has been selected to use any type of respirator (please circle yes or no).

1. Do you currently smoke tobacco, or have you smoked tobacco in the last month: Yes/No

2. Have you ever had any of the following conditions?

a. Seizures (fits): Yes/No

b. Diabetes (sugar disease): Yes/No

c. Allergic reactions that interfere with your breathing: Yes/No

d. Claustrophobia (fear of closed-in places): Yes/No

e. Trouble smelling odors: Yes/No

3. Have you ever had any of the following pulmonary or lung problems?

a. Asbestosis: Yes/No

b. Asthma: Yes/No

c. Chronic bronchitis: Yes/No

d. Emphysema: Yes/No

e. Pneumonia: Yes/No

f. Tuberculosis: Yes/No

g. Silicosis: Yes/No

h. Pneumothorax (collapsed lung): Yes/No

i. Lung cancer: Yes/No

j. Broken ribs: Yes/No

k. Any chest injuries or surgeries: Yes/No

l. Any other lung problem that you've been told about: Yes/No

4. Do you currently have any of the following symptoms of pulmonary or lung illness?

a. Shortness of breath: Yes/No

b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: Yes/No

c. Shortness of breath when walking with other people at an ordinary pace on level ground: Yes/No

d. Have to stop for breath when walking at your own pace on level ground: Yes/No

e. Shortness of breath when washing or dressing yourself: Yes/No

f. Shortness of breath that interferes with your job: Yes/No

g. Coughing that produces phlegm (thick sputum): Yes/No

h. Coughing that wakes you early in the morning: Yes/No

i. Coughing that occurs mostly when you are lying down: Yes/No

j. Coughing up blood in the last month: Yes/No

k. Wheezing: Yes/No

l. Wheezing that interferes with your job: Yes/No

m. Chest pain when you breathe deeply: Yes/No

n. Any other symptoms that you think may be related to lung problems: Yes/No

5. Have you ever had any of the following cardiovascular or heart problems?

a. Heart attack: Yes/No

b. Stroke: Yes/No

c. Angina: Yes/No

d. Heart failure: Yes/No

e. Swelling in your legs or feet (not caused by walking): Yes/No

f. Heart arrhythmia (heart beating irregularly): Yes/No

g. High blood pressure: Yes/No

h. Any other heart problem that you've been told about: Yes/No

6. Have you ever had any of the following cardiovascular or heart symptoms?

a. Frequent pain or tightness in your chest: Yes/No

b. Pain or tightness in your chest during physical activity: Yes/No

c. Pain or tightness in your chest that interferes with your job: Yes/No

d. In the past 2 years, have you noticed your heart skipping or missing a beat: Yes/No

e. Heartburn or indigestion that is not related to eating: Yes/No

f. Any other symptoms that you think may be related to heart or circulation problems: Yes/No

7. Do you currently take medication for any of the following problems?

a. Breathing or lung problems: Yes/No

b. Heart trouble: Yes/No

c. Blood pressure: Yes/No

d. Seizures (fits): Yes/No

8. If you've used a respirator, have you ever had any of the following problems? (If you've never used a respirator, check the following space and go to question 9:)

a. Eye irritation: Yes/No

b. Skin allergies or rashes: Yes/No

c. Anxiety: Yes/No

d. General weakness or fatigue: Yes/No

e. Any other problem that interferes with your use of a respirator: Yes/No

9. Would you like to talk to the health care professional who will review this questionnaire about your answers to this questionnaire: Yes/No

Part 3

Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.

10. Have you ever lost vision in either eye (temporarily or permanently): Yes/No

11. Do you currently have any of the following vision problems?

a. Wear contact lenses: Yes/No

b. Wear glasses: Yes/No

c. Color blind: Yes/No

d. Any other eye or vision problem: Yes/No

e. Any other eye or vision problem: Yes/No

12. Have you ever had an injury to your ears, including a broken ear drum: Yes/No

13. Do you currently have any of the following hearing problems?

a. Difficulty hearing: Yes/No

b. Wear a hearing aid: Yes/No

c. Any other hearing or ear problem: Yes/No

14. Have you ever had a back injury: Yes/No

15. Do you currently have any of the following musculoskeletal problems?

a. Weakness in any of your arms, hands, legs, or feet: Yes/No

b. Back pain: Yes/No

c. Difficulty fully moving your arms and legs: Yes/No

d. Pain or stiffness when you lean forward or backward at the waist: Yes/No

e. Difficulty fully moving your head up or down: Yes/No

f. Difficulty fully moving your head side to side: Yes/No

g. Difficulty bending at your knees: Yes/No

h. Difficulty squatting to the ground: Yes/No

i. Climbing a flight of stairs or a ladder carrying more than 25 lbs.: Yes/No

j. Any other muscle or skeletal problem that interferes with using a respirator: Yes/No

Part 4

(Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the health care professional who will review the questionnaire)

1. In your present job, are you working at high altitudes (over 5,000 feet) or in a place that has lower than normal amounts of oxygen: Yes/No

If yes, do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're working under these conditions: Yes/No

2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals: Yes/No

If yes, name the chemicals if you know them:

3. Have you ever been a member of a HAZMAT spill response team, or a member of a HAZMINCEN: Yes/No

4. Have you ever worked with any of the materials, or under any of the conditions, listed below:

a. Asbestos: Yes/No

b. Silica (e.g., in sandblasting): Yes/No

c. Tungsten/cobalt (e.g., grinding or welding this material): Yes/No

d. Beryllium: Yes/No

e. Aluminum: Yes/No

f. Coal (for example, mining): Yes/No

g. Iron: Yes/No

h. Tin: Yes/No

i. Dusty environments: Yes/No

j. Any other hazardous exposures: Yes/No

If yes, describe these exposures:

5. List any second jobs or side businesses you have:

6. List your previous occupations:

7. List your current and previous hobbies:

8. Have you been in other military services? Yes/No

Do you suspect that you were you exposed to biological or chemical agents while in the military or in a military operation: Yes/No

9. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications): Yes/No

If yes, name the medications if you know them:

10. Will you be using any of the following items with your respirator(s)?

a. HEPA Filters: Yes/No

b. Canisters (for example, gas masks): Yes/No

c. Cartridges: Yes/No

11. How often are you expected to use the respirator(s) (circle yes or no for all answers that apply to you)?:

a. Escape only (no rescue): Yes/No

b. Emergency rescue only: Yes/No

c. Less than 5 hours per week: Yes/No

d. Less than 2 hours per day: Yes/No

e. 2 to 4 hours per day: Yes/No

f. Over 4 hours per day: Yes/No

12. During the period you are using the respirator(s), is your work effort (circle):

a. Light: Yes/No Examples of a light work effort are sitting while writing, typing, drafting, or performing light assembly work; or standing while operating a drill press (1-3 lbs..) or controlling machines.

If yes, how long does this period last during the average shift (number of hours):

b. Moderate: Yes/No Examples of moderate work effort are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs..) at trunk level; walking on a level surface about 2 mph or down a 5-degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 lbs..) on a level surface.

If yes, how long does this period last during the average shift (number of hours):

c. Heavy: Yes/No Examples of heavy work are lifting a heavy load (about 50 lbs..) from the floor to your waist or shoulder; working on a loading dock; shoveling; standing while bricklaying or chipping castings; walking up an 8-degree grade about 2 mph; climbing stairs with a heavy load (about 50 lbs.).

If yes, how long does this period last during the average shift (number of hours):

13. Will you be wearing protective clothing and/or equipment (other than the respirator) when you're using your respirator: Yes/No

If ``yes,'' describe this protective clothing and/or equipment:

14. Will you be working under hot conditions (temperature exceeding 90 deg. F: Yes/No

15. Will you be working under humid conditions: Yes/No

16. Describe the work you'll be doing while you're using your respirator(s):

17. Provide the following information, if you know it, for each toxic substance that you'll be exposed to when you're using your respirator(s):

Name of the first toxic substance:

Estimated maximum exposure level per shift:

Duration of exposure per shift

Name of the second toxic substance:

Estimated maximum exposure level per shift:

Duration of exposure per shift:

Name of the third toxic substance:

Estimated maximum exposure level per shift:

Duration of exposure per shift:

The name of any other toxic substances that you'll be exposed to while using your respirator:

18. Describe any special or hazardous conditions you might encounter when you're using your respirator(s) (for example, confined spaces, life-threatening gases):

19. Describe any special responsibilities you'll have while using your respirator(s) that may affect the safety and well-being of others (for example, rescue, security):

Appendix B6-E

SPECIFIC RESPIRATOR DISQUALIFYING CONDITIONS

1. **Facial Deformities and Facial Hair.** Facial deformities or presence of excessive hair or other conditions that interfere with proper sealing of the respirator shall disqualify the applicant. Questionably disqualifying conditions shall be evaluated by fit testing.

2. **Use of Prescription Eyeglasses or Contact Lenses.** Individuals with prescription eyeglasses who are required to wear a full-facepiece respirator shall use special frames, purchased by the Navy, for their glasses that do not interfere with the facepiece seal. Special visual acuity and visual field requirements shall depend upon the nature of the work to be performed. Respirator users may wear soft contact lenses while using a respirator.

3. **Hearing Requirements.** These requirements shall be dependent upon the nature of the work to be performed. The service member's hearing shall be adequate to ensure communication and response to instructions and alarm systems. Individuals with perforated tympanic membranes cannot wear respirators in hazardous areas where inhalation or absorption of toxic materials or vapors through the perforation may occur. Existence of perforation by itself shall not immediately disqualify the individual from respirator use, but the examiner shall consider both the environmental conditions of the job and possible specific safety controls before reaching a final decision. Possible specific safety controls may also be recommended by the safety officer.

4. **Respiratory Diseases.** Disease affecting pulmonary functions may prevent respirator use. Significant restrictive or obstructive disease or perfusion disorders may preclude approval for use. Assessment as to the degree of disability shall depend upon the patient's history and clinical findings of X-ray and spirometry, where indicated. Special analysis shall be required when perfusion disorders are suspected.

5. **Cardiovascular Diseases.** Symptomatic coronary artery disease, significant arrhythmias, or history of recent myocardial infarction shall disqualify the service member from respirator use. Occurrence of frequent premature ventricular contractions (PVCs) with elevated pulse rates shall be considered disqualifying. The examiner, using clinical judgment, shall decide if individuals with uncontrolled hypertension or related symptoms and individuals on blood pressure or cardiovascular medications may wear respirators.

6. **Endocrinal Disorder.** General work limitations and restrictions identified for other work activities also apply for respirator use. If the service member may suffer sudden loss of consciousness or response capability, the examiner shall determine if the service member may use a respirator.

7. **Neurological Disability.** Inability to perform coordinated movement and conditions affecting response and consciousness shall disqualify the service member. Epilepsy, controlled on medication, should not be disqualifying if

the patient has been seizure-free for 1 year and has no significant side effects from medication.

8. **Medications.** The examiner shall use clinical judgment to determine if an individual should be denied use of a respirator due to a history of excessive use or problems related to prescription and non-prescription drugs, including alcohol, that affect judgment, performance, or reliability or alter the state of awareness or consciousness.

9. **Psychological Condition.** The examiner shall decide if a service member with a psychological condition that results in poor judgment or reliability should be disqualified. A history of claustrophobia may disqualify the service member. The examiner shall consider the severity of the individual's claustrophobia, and may recommend field-testing for the individual, prior to approving or denying use of the respirator. Clinical history or indication of severe anxiety shall also be considered by the examiner in determining an individual's ability to use respirators.